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The role of formal and informal networks in supporting older people's care during extreme weather events

Introduction

While the impacts of climate change on human health and wellbeing are well-documented (see for example, McMichael 2011; World Health Organisation, 2008; Haq *et al.* 2010; IPCC 2011), less attention has been paid to the impact of climate change on the infrastructures (especially health and social care facilities, people's homes, communications, utilities and road networks) supporting health and social care delivery (for example, hospital services, community nurses, care workers, and general practitioners) (Carthey and Chandra, 2007). For example, cuts in domestic power supply from floods may lead to: the loss of refrigeration for medicines such as insulin; reduced mobility through disruption to electric chairs, beds, and hoists; loss of heating and cooking facilities; and the loss of telecare services. Consequently, alternative arrangements need to be considered as part of mitigation and adaptation strategies. Furthermore, (Oven *et al.*, 2012) highlight that older people in the United Kingdom, especially those already in poor health, are particularly vulnerable to weather-related hazards. Haq *et al.* (2010: 1) argue that groups such as older people who are most likely to suffer material poverty and physical and psychological vulnerabilities are also likely to be less resilient to adverse impacts of climate change. Older people are the main users of social care services. The NHS Information Centre (2011: 34) identifies that more than twice as many people over the age of 65 years (1,148,000) receive services in England than those in the 18-64 years age group (550,000). With the older population (aged 65 years and over) in the UK projected to increase from 16% in 2006 to 23% by 2033 (ONS 2010), demand on health and social care services is likely to increase further.

We note Clark's (2009) argument that whilst older people are frequently characterised as 'vulnerable', there is a risk that older people may be perceived as passive recipients of care, leading

to restrictive interpretations of concepts such as independent living for this age group. However, by virtue of their disproportionate use of health and social care services, older people are potentially more vulnerable to disruptions in their supply. The UN International Strategy for Disaster Reduction (2004: 16) provides a useful definition of human vulnerability, characterising it as ‘the conditions determined by physical, social, economic, and environmental factors or processes, which increases the susceptibility of a community to the impact of hazards.’ Consequently, if we accept Clark’s views, we need to develop research approaches that address the range of vulnerabilities of particular groups, including older people, to events that can disrupt services, whilst ensuring that these groups are engaged in developing these approaches and services. Responding to the diverse social care needs of older people requires practitioners , ‘to engage with the complex arguments and realities around climate change if they are to effectively...help build their resilience in preventing and/or adapting to its consequences’ (Dominelli, 2011: 431). Recognising and embedding these complex arguments within local settings forms a key component of the research outlined in this paper.

This paper draws on case study research and has two main aims: firstly, to outline a methodology for including the views of older people and service providers (person-centred research) combined with climate change and infrastructure modelling; secondly, to explore in the case study areas the resilience to extreme weather events of the infrastructures, service agencies , individuals and communities (that together comprise health and social care systems). .

The paper is in three sections. First we briefly describe the localities in which the study was undertaken. We then outline the research methods and summarise the research design and the ethical issues involved in approaching older (and possibly vulnerable) people, as well as service providers about potentially sensitive issues of interest here. Finally, we present the findings from the case study and these are discussed in relation to more general themes in the academic literature including formal and informal networks of care (e.g., Davis *et al.*, 2011), governance (e.g., Klijn and

Koppenjan, 2012 and Bevir, 2011), complexity (e.g., Cilliers, 1998 and Uprichard and Byrne, 2006), and ageing (e.g., Milligan, 2009). The paper concludes by arguing that links between formal and informal systems of care need to be better integrated during emergencies to avoid discontinuities that could endanger older people's health and well-being. The findings contribute to the literature by highlighting how climate change and extreme weather events in particular create new dynamics within already complex systems of health and social care.

Context

A case study of two neighbouring villages in northern England was conducted in summer 2010. The case study settlements were purposively selected (Bryman, 2008) to represent theoretically relevant settings and populations, and were based on local intelligence. Following conversations with a regional Community Resilience Officer, the first locality, 'Valley Village', was identified as having experienced two significant flood events over the past 10 years. Closer engagement within the area, in particular through meeting local community workers and residents, helped to identify the significance of a further extreme weather event, a prolonged cold spell in the winter of 2009/10, which impacted on older people in the area. A second locality, 'Hill Village', which borders 'Valley Village' and is located on a steep hill was even more severely affected by this cold weather and therefore was included in the study. This 'snowballing' (Bryman, 2008) of the sample (through participants suggesting we interviewed older people and care providers from the neighbouring village) enabled us to more fully examine the impact of two different types of weather events on health and social care services for older people. As noted by Oven *et al.* (2012a), climate change projections generated for the wider region in which the two study villages are located had suggested that there will be an increased risk of heatwaves, but that future extreme cold weather events will still take place, albeit with a lower probability of occurrence, and may cause major disruption. Flooding risk is important in several parts of the region. By snowballing the sample we also responded to the weather-related hazards reported by older people and practitioners living and

working in the area. Thus, our choice of cases provided a 'lens' through which more general relationships between locality, place, health and social care, and the consequences of local extreme weather events could be explored.

Valley Village has fewer than 1,000 residents and Hill Village has a population of about 4,000 people. Both villages are former coal-mining communities and are situated in a particularly economically deprived part of England. The local government authority used 2001 Census of Population data to produce neighbourhood profiles to reflect 'natural' communities. A neighbourhood profile was developed, by the local authority, for 'Hill Village South and Valley Village', the places which formed the main focus of our study. Local population characteristics (based on the 2001 population census, the most recent data then available for the case study area) included: 28.1% of people aged 65 years and over (compared with an England average of 15.9%), 40.2% of households comprised only retired people (England, 23.7%), and the 'proportion of the total population reporting that their health was not good' was 18.2% (England, 9.0%). The proportion of the population from Black and Minority Ethnic groups (1.3%) was lower than the England average of 9.1%. In addition, based on local data collected in 2006/07 on the proportion of older people 'helped to live at home' rated the neighbourhood as the 6th highest of 85 in the local authority.

Services provided in the locality include: local authority provided domiciliary care services; district nursing services; a range of independent sector care services; a local general practitioner's (GP) surgery and pharmacy, both located in Hill Village; a 'Live at Home' scheme (supported by a local voluntary group); an older people's daycentre; a warden sheltered housing scheme in Hill Village (which includes activities for non-residents in the communal lounge); mobile wardens; the local authority's telecare service; meals on wheels; and a mobile library service. Road access to the villages from the South is prone to flooding and from the north it is more heavily disrupted by snow and ice in cold spells. The villages are located five miles away from the nearest small town and 11 miles from the closest city.

Research methods and ethics

Research design

The research was informed by the disciplines of social work, social policy, sociology, health care, psychosocial development, geography and engineering. The research design was influenced by ‘case/narrative approaches’ which Abbott (1992: 65) describes as, ‘...a new way of regarding cases as – fuzzy realities with autonomously defined complex properties – and a move second to seeing cases as engaged in perpetual dialogue with their environment (cited in Byrne 2009: 102).’ The narratives used here are not extensive individual case history accounts, but rather descriptions of events offered by respondents in their own words. In developing the case study approach described here, the principal data collection methods were semi-structured interviews and focus group discussions.

The research assembled individual and collective accounts. These can be regarded as descriptions of trajectories *and* descriptions not of single systems but of the interweaving of complex systems (Uprichard and Byrne, 2006: 668). Uprichard and Byrne (2006: 666) argue that narratives are essential for creating meanings about social systems and allow for the conscious reflexivity of individual or collective social action. They continue (*ibid.*), ‘the question of how to incorporate agency into complex understandings, whilst also taking into consideration the interaction between macro-, meso- and micro-levels and the implications of reflexive action needs to be resolved...narratives can help us to represent agency, which is (a) multiple, (b) multilevel, and (c) takes account of conscious reflexivity between and within the different levels of multiple agency shaping the emergent urban form.’ Whilst our research does not focus on urban areas *per se*, it does involve all the characteristics of multiple agency identified by Uprichard and Byrne and includes interactive exchanges through narratives created within human relationships and conversation.

. The descriptions offered by older people and care providers represent their experiences of local networks of formal and informal health and social care; and how these interacted with extreme

weather events and the built infrastructure. In so doing, the research approach builds on Head's (2008) argument for more 'relational' approaches to complex problems which are associated with a stronger emphasis on stakeholder perceptions and their accounts. Furthermore, the parts of the system described through the narratives are more or less contingent (Cilliers, 1998) on each other and are dissipative (Reed and Harvey, 1992) in that they are interconnected with their environments and are part of bigger systems. In other words parts of these systems interact with each other and with the system as a whole, and, in turn, these parts of the system interact with other 'external' systems. In this case study, older people's and service providers' accounts of local systems provided insights into service users' and providers' reactions to broader trends regarding climate change and national welfare restructuring, and indicated how these stories were both contingent upon and related to each other.

The interviews and focus group discussions concentrated on the following topics:

- Help currently required/received by older people. How is this provided and by whom?
- Extreme weather events, how the respondents have been affected in the past and their perceptions of future hazards/risks.
- Adaptation and response to extreme weather events at different levels (e.g. individual, family, community), and how local support services targeted vulnerable individuals including a critical review of health and social care services.

We conducted six in-depth, one-to-one interviews with older people, aged between 66 and 81 years. The older people we interviewed were recruited through a local day centre run by a charity. We were conscious of different levels of vulnerability amongst the 65 years and older age group and spoke to people who self-identified as 'healthy' as well as those with a range of different impairments including impaired vision, mild dementia, and severe arthritis. In addition, we met with a local community group for an informal discussion that provided further information about the study areas. Two further focus groups were attended by a total of nine participants, including

managerial level personnel and frontline workers with a range of responsibilities across adult social care and resilience and climate change in the local authority; a water company; and the local NHS. Additionally, four one-to-one interviews were conducted with service providers and community and voluntary sector representatives. With the exception of the informal discussion, where written notes were made, all of the interviews and group discussions were digitally recorded.

Our multidisciplinary approach was incorporated into the focus groups in two ways. Firstly, three academics attended each of the focus groups ensuring representations and contributions from both physical and social sciences at these meetings. Secondly, we invited practitioners from the variety of organisations identified in the paragraph above to the focus groups and facilitated interactions and discussions between different professions/role-types/disciplines in the locality as a key part of the research design. We received feedback that not all service providers had talked collectively about the research issue before the meetings, so for them, the meetings were useful exercises in bringing together local knowledge. Such exchanges are important in planning for risks associated with extreme weather in complex systems supporting older people's care, especially given the fragmentation of local governance arrangements (see for example, Bang, 2004; Bevir and Rhodes, 2003; Fenwick *et al.*, 2012; Kooiman, 2003; Painter and Pierre, 2005; Scharpf, 1999) and the increasing specialisation of knowledge in 'expert systems' (see for example, Bauman, 1987; and Beck, 1992).

Data analysis was conducted through a thematic analysis of transcripts of interviews and focus group discussions. This approach helped to identify commonalities and differences in the themes that emerged. Quotations that are indicative of these themes have been selected to highlight these differences and commonalities. It should be noted that the research was based on a relatively small-scale study. Thus, the findings and conclusions may not apply more generally to other local settings,

and especially not to urban contexts. In addition, the views of older people who are housebound and/or completely socially isolated have not been considered in this study.

Ethical issues

The study focused on a group of people who were identified as potentially vulnerable, given that the older population may be less physically, emotionally, and financially resilient to dealing with climate-change related hazards (Haq, *et al.*, 2007) and have greater needs for health and social care than younger people (DoH, 2002 and Few and Matthies, 2007). Consequently, the researchers needed to consider how to approach this group, as emphasised by Bowers *et al.* (2011: 23) who discuss specific ethical issues in relation to hearing the voices of older people who have high support needs or might lack capacity. We considered that participants might become distressed during the interviews when discussing sensitive issues about their care or events relating to extreme weather. Consequently, 'alarmist' presentation of future scenarios was purposefully and carefully avoided to reduce unnecessary concerns about the effects of future events such as floods or bad weather. We also stressed that a key aim of the study was to share information that would make it easier to manage any future weather-related challenges to service access and delivery. The design of the semi-structured interviews and focus group schedules reflected these concerns.

We considered possible risk or harm to research participants (and researchers) through participation in the study. To address this, we ensured that participants were both safe and comfortable when attending interviews and that the venues were in suitable and safe places. In addition, all the participants read information sheets about the study prior to being interviewed and had the opportunity to ask the researchers any questions prior to signing consent forms allowing anonymised information to be used for the study. We were also prepared to provide participants with a list of suitable contacts for expert advice or refer them to the appropriate services, should they require this, especially if they found interview questions distressing. We ensured that arrangements were made for someone to be available to debrief participants after the interviews, if

they wished to talk to someone other than the research team. The processes outlined above were agreed by our University Research Ethics Committee and the relevant local authority research governance board. Thus the study conformed to internationally accepted ethical guidelines and relevant professional ethical guidelines. No special ethical difficulties arose in the study and participants reported that they found their involvement to be rewarding.

Findings and discussion

The following findings are divided into four related themes: significance for resilience of local contextual characteristics; recent experiences of extreme weather; networks of formal and informal care; and local co-ordination of information and resources. This section of the paper concludes with consideration of some potential implications of recent developments in policy and public sector funding.

Local contextual characteristics

Dominelli (2012: 202) argues that ‘resilience’ has re-emerged as an active concept concerned with the, ‘capacity of systems, whether natural, human or hybrid, to sustain themselves in the face of endogenous and exogenous shocks to an existing state.’ The local contextual characteristics generally prevailing in the case study areas produced an apparently conducive setting for the emergence of resilient networks of local cooperation between family support and public sector providers, i.e., informal and formal networks of care. According to Moseley and Pahl (2007) this kind of social cohesion is a strength of small communities, generated through the accumulation of local knowledge when there are good lines of communication.

In general, the older people we interviewed enjoyed living in the area. They liked the rural setting and, in most cases, the sense of community in the locality. The participants that accessed social care services were happy with the services they received during extreme weather events. As evidence, they cited examples of flexible and adaptive care provision:

'I get a piece of paper with whose coming and when so I know who is coming. If I ring the council and they know I am stuck for someone to come they send someone else – it is well organised... The carers come in all weathers – I think they get the local ones to come.'

Participant A.

Despite such positive responses about the localities, all the residents interviewed commented on the decline in amenities in the area, especially the recent closure of the Post Office which local residents had previously successfully campaigned to keep open. The closure of the Post Office, as a social and shopping hub, was regarded as a significant loss to the community. One respondent commented that:

'The Post Office was the centre of village life. If I hadn't been in for a week they'd phone up to see that everything was alright. Now that's gone. That was one of the reasons for keeping it open; that and winter access [to amenities].' Participant E.

Such threats to local service provision may be typical of a more general trend in rural England where employment is in decline, weakening local economies that support shops and services in small settlements, and most residents have to travel further for basic services (since those with cars drive to larger shops further away) or pay more for deliveries. For De Bruin *et al.* (2011: 276) this decline can be problematic when it leads to fewer local supports to independent living since for those who are less mobile associated with a decline in local services while those remaining become more expensive.

Recent experience of extreme weather events

What appears to matter most to the older people we interviewed is extreme weather events that disrupt day-to-day practices and routines over an extended period of time. Thus the communities were quite resilient in general to short run weather related events, such as occasion when the local area flooded following an extended period of heavy rain in September 2008, closing the bridge over

the river to the south of the villages. Whilst the effects of the flooding were severe, they were short lived, for most residents. However, some individuals near to the river whose houses were flooded were more severely impacted. The home of one of the older residents (aged 66 and not in receipt of health or social care services) was flooded and was not made habitable again for approximately six months. In the interim, the insurance company arranged alternative accommodation in the village that proved to be too cold during the winter months.

For most of those we interviewed, regardless of whether they were receiving or delivering care services, a prolonged period of freezing weather with snow in the winter of 2009/10 was most disruptive to both villages because local roads and pathways were blocked for much longer than during the floods. This was a particular concern for older residents in 'Hill Village', due to the location on a steep slope and the problems this caused for accessibility into, and mobility around, the village.

An aspect of resilience which helps older people to cope with such events may be the commonly held position of acceptance and stoicism, as illustrated by the following quotations:

'You've just got to accept there is bad weather, you can't turn a switch to make the weather better.' Participant A.

'Ooh I've seen it snow and there's not much you can do about that.' Participant B.

Interviewer: 'When there were floods recently, was it a problem?'

Participant B: *'No, well it was a problem in one way but I just laughed and thought "trust us to be in this". Lads from [nearby city] came and really made a good job [of the clean-up].'*

Networks of formal and informal care

Other aspects of resilience may relate to social networks. Davies (2002) argues that by creating networks and partnerships various groups and stakeholders have been brought into cooperation

with the state as partners in governance structures. Networks of institutions and individuals acting in partnership and held together by relations of trust are part of the transformation of the state into an 'enabling partner' (Bevir and Rhodes, 2003: 55). Blackman (2006) discussed links between social networks and social capital, describing how social or family ties and participation in community activities support a sense of belonging, reciprocity and trust in others. However, networks are also complex and operate in unpredictable ways, increasing uncertainty about the impact of policy (Ormerod, 2010) or social support during disruptive events. We used the concept of networks to explore formal (institutional and professional) and informal (family and social) care in the case study area. Arshad (2011: 6) argues that, 'while definitions of informal social networks can be opaque, it is understood that an individual's family, friends, neighbours, and communities of interest (including the informal connections developed in work, education, and neighbourhood settings, as well as those increasingly formed on-line) are at the centre of the construct.'

The older people we spoke to were generally very positive about the formal and informal care they received. This can, at least in part, be attributed to historical and contextual factors in the localities. Both villages were close-knit former coal-mining communities with a tradition of strong social networks and local co-operation, which apparently enhanced local resilience during the extreme weather events. In the event of emergency or extreme weather, these formal and informal networks appear to have come together in what Davies (2002) calls 'common interest networks', through which actors are connected by ideas, concerns, events and organisations. The resilience of such networking arrangements was illustrated in our study by responses to failures in the physical infrastructure posed for service delivery during the prolonged cold spell. Frontline service providers identified the road network as being particularly important for the planning and delivery of health and social care services to older people, especially given the relatively remote location of our study villages. These were disrupted during the cold spell so that some independent sector care providers could not access the villages from the larger urban settlements where they lived. They asked the local authority domiciliary care team to cover for them, which they did. The responsiveness of

public sector providers was at least partly attributable to characteristics of the domiciliary care workforce, which is, and has historically been, highly localised with approximately 90 per cent of the workforce serving our study areas living in 'Valley Village' and 'Hill Village'. One service provider commented that:

'...when you have the times of the floods, and especially the snow and ice and that, last year, we were able to continue to deliver the service on foot. That's the only reason we've been successful because of people being able to get there. But we were also relying on good will because people had to come out when it wasn't their day to work.' Domiciliary care manager, Focus Group 1.

This illustrates the importance of spatial proximity and also suggests a strong 'duty of care' amongst this local workforce associated with the strong sense of community identity which existed amongst residents. This 'public spirited' ethos meant that some providers worked beyond their formal responsibilities, aiding continuity of care.

Managerial organisation also contributed to resilience. Within the local domiciliary care workforce non-essential travel to and from the area was discouraged to reduce the chances of vehicles becoming stuck in the snow or ice, as illustrated by the following participant:

'The boss said "Don't come into the office, stay in the village and sort it out"'. Domiciliary care worker, Focus Group 1

Consequently, during the cold spell, the workforce was delegated considerable local discretion to manage resources to meet local needs. Older people who were most in need or vulnerable were prioritised. Services were also prioritised so that people's key daily needs were met, for example, help with personal care was prioritised over laundry or ironing. In addition, service delivery was reassigned amongst care workers so that carers provided services to older people closer to where they lived and within walking distance. The above examples demonstrate a willingness to be

flexible, and an ability to re-deploy resources within and across services as circumstances require, aided by good communication and coordination between providers in different sectors. It also presupposes a working telecommunications infrastructure.

The older people were supported by a range of people and providers, including neighbours, family and service providers (such as the domiciliary care service). The importance of close family, particularly their daughters, but also sons and grandchildren, in providing informal care was also emphasised by the more vulnerable participants. For example, an older lady with mild dementia and partial blindness commented that:

'I don't get any help, nor meals-on-wheels. But I've got a daughter, you see, and she does everything.' Participant B

In most cases, family members would also be available to provide assistance during an extreme weather event. As most of the formal and informal care was provided by women, this also highlights the gendered nature of care (Milligan, 2009 and Dominelli, 2012). Additionally, this reliance on family members raises the question of how to link family networks providing informal care to the more formal networks of care provided locally. There is a role here for health and social policy to encourage the joint development, and use, of informal and formal networks in the community. The study suggests that the older people we interviewed are able to 'tap into' different forms of care when they need to. For example:

'They come in all weathers. My daughter uses her husband's four-wheel drive car when it is snowy or icy...The carers come in all weathers too. I think they get the local ones to come [when it is snowy]...They always come through.' Participant A.

In addition, changes to service provision were communicated effectively to those receiving care services, and there was a general view that the community 'pulled together' during this period. Furthermore, domiciliary care workers and managers identified connections to people working in

the locality, such as milkmen, postmen and paper delivery workers, who were aware of older people's routines and alerted the domiciliary care workforce to changes to these during the prolonged cold spells.

Through a range of informal (such as friends, neighbours and family) and formal (such as domiciliary carers, community nurses, GPs and pharmacies) care networks, the more vulnerable older people we interviewed managed to remain well-supplied with food and medication. This included deliveries from the local pharmacy to older people who were unable to collect their medications themselves during the prolonged cold spell. Their capacity to access a range of carers chimes with Bowers *et al.* (2011:5) who comment that, 'the capacity of support based on mutuality and reciprocity to adapt to changing – often uncertain – circumstances and needs over time... appears to be a key success factor regardless of the degree of formality / informality (etc.) involved.' Indeed, Arshad (2011: 1) highlights that together formal and informal networks 'form an ecology of social support that individuals can draw upon in times of need.' Our research points to the reciprocal nature of formal and informal support networks, whether they are explicitly connected or separate, but does not allow us to fully unpack this 'ecology'.

Noordegraaf and Newman (2011: 520-1) argue that the failure of local government to respond to a tornado event in a large city in the, UK, in 2005 was associated with management changes in response to 'modernizing' and privatizing imperatives imposed by national reforms to local government, and policies intended to decentralize power and enhance citizen participation. The same national policy changes to the management of local governance arrangements pertained to our case study, however, compared with the urban context described in Noordegraaf and Newman's research, the small rural localities described in this paper differ markedly in the scale and nature of the system. Kearns and Joseph (1997: 24) argue that due to the smaller scale of organisations in rural communities, individuals have the capacity to exercise leadership and create a communal identity. We saw this in our case study research where the significance of local context is

emphasised. Our findings also support arguments by De Bruin *et al.* (2011: 280) argue that in some community settings a 'high level of social capacity' may offer benefits that partly counter socio-economic marginality. ***Local co-ordination of information and resources***

Despite these positive contextual factors that served to enhance local formal and informal networks of care, some concerns about local governance arrangements were identified by participants.

According to Stoker (2004:59) 'governance' suggests an end to direct, statutory service provision by local government and a more laissez-faire approach to procurement; involving more negotiation and bargaining, legitimising many stakeholders and participants; encouraging consumer influence beyond elective democracy; and suggesting a key role for government as a facilitative leader.

However, the heterogeneity and differences of values, ideas and norms of actors in this type of system can reduce the scope for coordinated decision-making and weaken trust between different actors and agencies, raising difficulties in emergency situations that require inter-agency cooperation and sharing of resources (Kapacu and Garayev, 2011). In a wider complex system including infrastructure as well as service providers, the situation is even more challenging.

This can be illustrated through an example from our research of potential for failure of built infrastructure, involving the electricity supply which is essential for health and social care delivery, and which may be vulnerable to severe storm and flood events. Whilst the electricity supply in the localities was considered to be much more reliable than in the past and generally resilient to the weather events we have described, it was also identified as being increasingly important for equipment used to provide medical care for older people, such as hoists, oxygen supplies and dialysis machines. The local authority reported limited control of access to back-up generators and battery packs, given that electricity companies are responsible for providing these. The electricity companies have their own lists and priorities concerning vulnerable people and they are aware of those older people who have medical equipment requiring electricity. The local authority and the Primary Care Trust have their own, separate lists of people in the area that could be classed as

vulnerable due to health and social care needs. In 'Valley Village' a flood warden scheme also maintains its own list of vulnerable people.

The practice of maintaining separate lists of vulnerable people raises questions about the scope for sharing confidential and personal information in order to produce more comprehensive, shared risk registers. Data sharing about vulnerable people requires permission, co-ordination and co-operation. The Civil Contingencies Act, 2004 requires the sharing of such information during emergencies. However, it was suggested in focus group discussions that during emergency situations, private companies had been reluctant to share information about individuals classified on their records as 'vulnerable'. Although neither of the extreme weather events that we have focused upon caused major disruptions to health and social care services through cuts to the electricity supply, service users and practitioners raised concerns about the local co-ordination of information about those who would be most vulnerable if this happened. This finding illustrates Noordegraaf and Newman's (2011: 514) argument that emergency events raise important management questions and require the mobilisation of people and resources that stretch capacities of institutions to the limit, 'they are also *discontinuous*, and may, therefore, disrupt assumptions about what makes for (good) management in "orderly" times.' Good governance, therefore, includes contingency planning and preparedness, supported by effective implementation arrangements at times of emergency.

A further example of the complexities of the governance arrangements involved in extreme weather events relates to the distribution of limited resources. It was reported that, in response to a phone call from a local resident and flood warden, a water pumping machine was brought to the locality by the fire service during the floods. Participants suggested to the researchers that if the call had been made half an hour later, this pump would have been sent instead to a town in the north of the region, which was also flooded at the same time. This experience suggests that such resources are in short supply and allocation may be on a 'demand-led' rather than a 'priority need' basis. This raises questions not only about the adequacy of supply but also about allocation criteria.

Implications of recent developments in policy and funding

Given the importance placed in this paper on formal and informal networks of support for older people, there is a need to link networks of exchange and reciprocity (see Bowers *et al.*, 2011) into emergency planning procedures and arrangements associated with extreme weather events. In the rural communities we studied these networks appear to be historically well connected. However, other research cited above suggests this may not be the case in other parts of the UK.

According to Noordergraaf and Newman (2011) *embedded action* (public action related to the 'real world' of citizen and social dynamics, the natural make-up and traditions of places, and the role of public management itself in re-ordering spaces) is critical as it provides links between regular public management and crisis management and this cannot be detached from local circumstances and histories. Our case study demonstrates this; regular and crisis management were not rigidly interlinked, rather flexible and mutually reinforcing. Kapacu and Garayev (2011) argue that even though disasters are relatively infrequent (low probability high consequence events) the sustainability of inherently *ad-hoc* network systems is essential for future successes in coping with the impact of disasters.

Such resilience may be undermined by public sector retrenchment during economic austerity. Ginn (2010: 51) argues that English local government agencies '... are facing reduced central grant averaging 7% a year over the next four years ... [and] ...essential services for the old and vulnerable will be at risk...'. Davis *et al.* (2011: 693) suggest local government agencies are withdrawing from discretionary care services and are 'retreating' back to high-priority core activities, creating increasing inequality between older people on the basis of eligibility and finances. Eight out ten councils are preparing to provide domiciliary care services only to the severely disabled, which will disproportionately affect older people (Ginn, 2010). Furthermore, such policies may reduce the numbers of frontline practitioners that could be drawn upon in local areas in the event of an emergency, which was a concern reported by emergency planners in our focus group discussions.

The local government agency covering our case study areas has recently undertaken a budgetary consultation in response to the decline in central government funds. The adult social care commissioning budget has been the target for the majority of social care funding cuts and will be reduced by over a quarter by 2014. In making the bulk of cuts to social care through the commissioning budget the local government agency intends to continue providing care to those with 'substantial' and 'critical' needs. While this will result in limited reduction in direct provision of care services to older people, reductions in funding will be concentrated in measures to reduce commissioning of voluntary sector groups, carers, and preventative and social support services. The local government agency is seeking to work with providers and groups to mitigate the impacts of this decline in funding but acknowledges it may not be entirely successful.

The extent to which such changes will impact on the informal and formal networks we describe above is, as yet, unclear. Davis *et al.* (2011.) argue that many social workers are uneasy about these developments and have used various subterfuges to sustain a wide range of support services to their clients, but this may be less feasible as cuts deepen. Given the significant role of these workers in this study in providing embedded networks of support for emergency responses to extreme weather events, this development is of particular concern. This is particularly significant given the role which carers, voluntary sector groups and social support services play in providing and supporting informal networks of care. We have shown above that continuation of the types of networks described here is far from certain given the ongoing cuts to public sector funding and the continued restructuring of health and social care, that have given the independent sector a growing role in health and social care delivery (for example, see Knapp *et al.*, 2001 and Milligan, 2009). The independent sector was seen as less reliable than public sector systems during extreme weather events in the case study area. Although the case study also demonstrated local contextual characteristics that were fairly robust and resilient to extreme weather events experienced so far

this should not be taken for granted in future. This is especially significant given the findings of Owen *et al.* (2012) which predict an increase in the frequency of weather-related hazards in the UK, such as floods and heatwaves associated with climate change, which may cause disruptions to older people's services in the future. Older people, for example, are potentially vulnerable to heatwaves, which may lead to dehydration and overheating that can make symptoms worse for people with breathing difficulties and heart problems. This in turn could create high volumes of demand on health and social care services raising questions about planning and capacity to meet needs at these times.

Conclusion

This study provides insights into how extreme weather events can affect the continuity of older people's health and social care. Although the case study relates to a particular setting in England, the type of scenario reported is one which is being experienced across the country and internationally, arising from the combined effects of demographic aging, climate change and economic pressures on public services. The principles for locally sensitive research to inform action which we have discussed can be widely applied.

The methods used here enabled us to assemble individual and collective accounts from older people and services providers, through which three overlapping themes emerged in the research: the importance of local contextual characteristics for resilience; the need for well integrated, flexible and adaptable networks of formal and informal care; and local co-ordination of information and human and physical infrastructure resources across interconnected systems. Failures in the built infrastructures such as road transportation and in formal (largely independently provided) care had potentially serious consequences for the continuity of care and individuals' well-being. However, these dangers were mitigated to some extent by informal caring services provided by family and neighbours, together with the additional contributions of locally embedded public sector providers helping to fill the resulting gaps in provision. These findings contribute to an international literature

about network governance and innovation in public policy (see for example, Davis *et al.*, 2011 and Klijn and Koppenjan, 2012) and governance systems and emergency management (see for example, Kapacu and Garayev, 2011 and Noodergraaf and Newman, 2011).

By concentrating on a particular group (older people) in a small spatial setting we were able to consider reflexive action across governance arrangements and interactions between different levels and parts of the system during extreme weather events. Consequently, the paper draws attention to the importance of local history and context in the emergence of *ad hoc* networks during emergencies. Our findings suggest that policymakers and practitioners, including emergency planners, should enable and facilitate local (community/neighbourhood) stakeholders to develop links between formal and informal carers in various different sectors and develop preparedness to help reduce the impacts of discontinuities of care should an extreme weather event occur.

Looking to the future, our evidence does not permit us to be fully confident that the local arrangements identified through this case study will be sustainable. In this respect three factors may become increasingly relevant. First, reduction in public funds for services and amenities in rural areas may undermine historically close-knit communities. Second, reductions in public expenditure may weaken the connections between formal and informal networks of care. Third, any dilution in the capacity of either formal or informal contributions will spread resources more thinly and make the co-ordination of effective responses at times of emergency even more difficult.

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